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A PRELIMINARY WASTEWATER
ASSIMILATION STUDY ON THE
RIDEAU RIVER BELOW THE TOWN
OF SMITH'S FALLS

FEBRUARY, 1967

ONTARIO WATER RESOURCES COMMISSION

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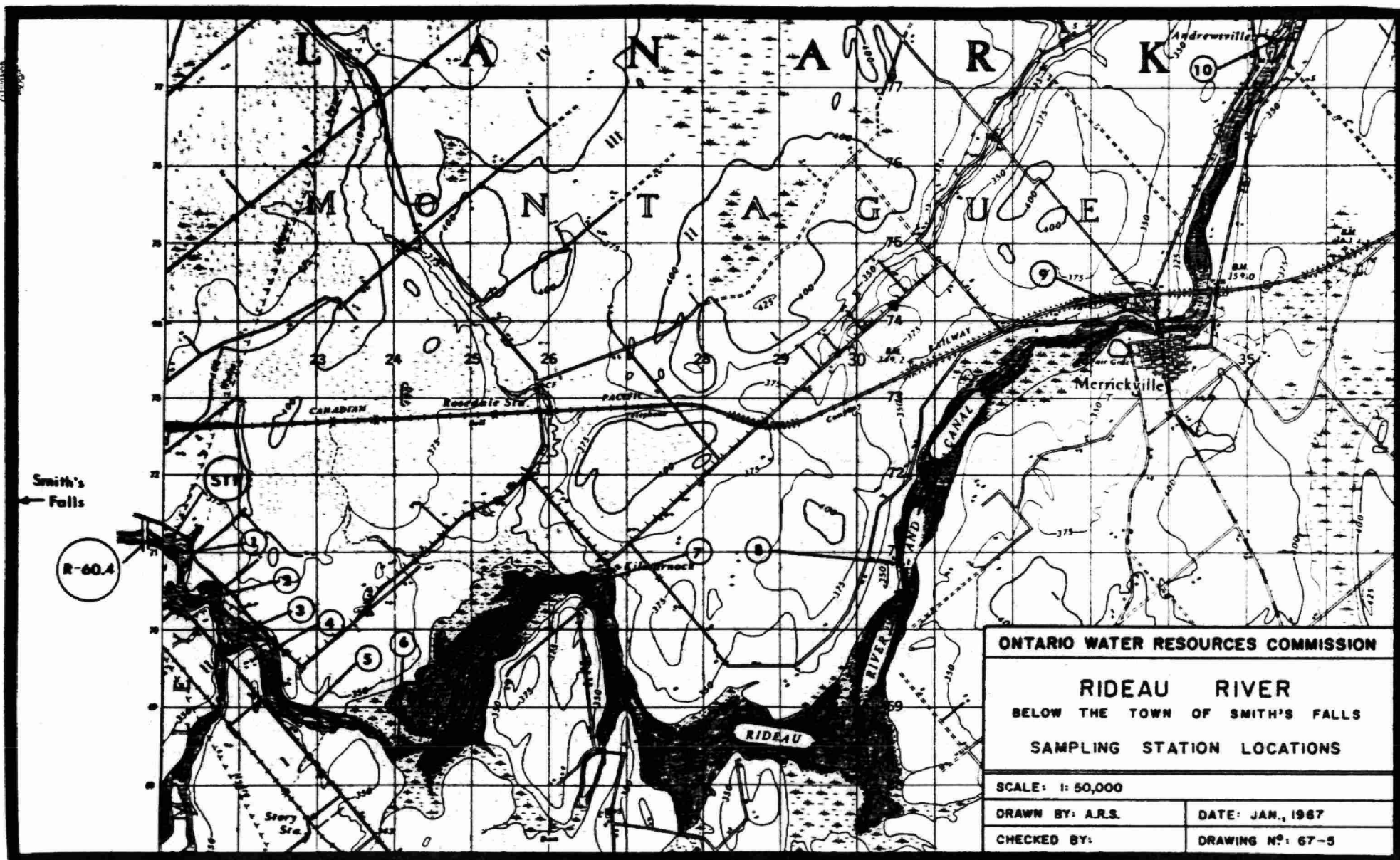
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SUMMARY

The Rideau River below the Town of Smith's Falls is a very productive stream as indicated by the presence of abundant varieties of fish and aquatic plants. Dissolved oxygen and biochemical oxygen demand levels are satisfactory throughout the reach under consideration. However, excessive bacteriological counts have occurred repeatedly downstream from the sewage treatment plant.

The river is used extensively for swimming and fishing and the Rideau Canal is a major attraction to the boating public.

RECOMMENDATIONS

1. The Town of Smith's Falls should take the necessary action to prevent the discharge of raw sewage solids from the sewage treatment plant to the Rideau River.
2. Disinfection procedures at the treatment plant will have to be improved in order that coliform counts in excess of the OWRC objective of 2400 organisms per 100 ml. are prevented.
3. Separate sewers for sanitary and storm flows should be provided in order to eliminate overflows of untreated sewage to the Rideau River.

INTRODUCTION

On August 29 and 30, 1966, a reconnaissance survey of the Rideau River and Canal at Smith's Falls was completed. The results of that survey and some general information concerning the stream are presented.

BACKGROUND INFORMATION

The Rideau River is a wide, slow-moving stream that flows through Eastern Ontario in a north-easterly direction to confluence with the Ottawa River at the City of Ottawa. It is used extensively for fishing, boating and swimming.

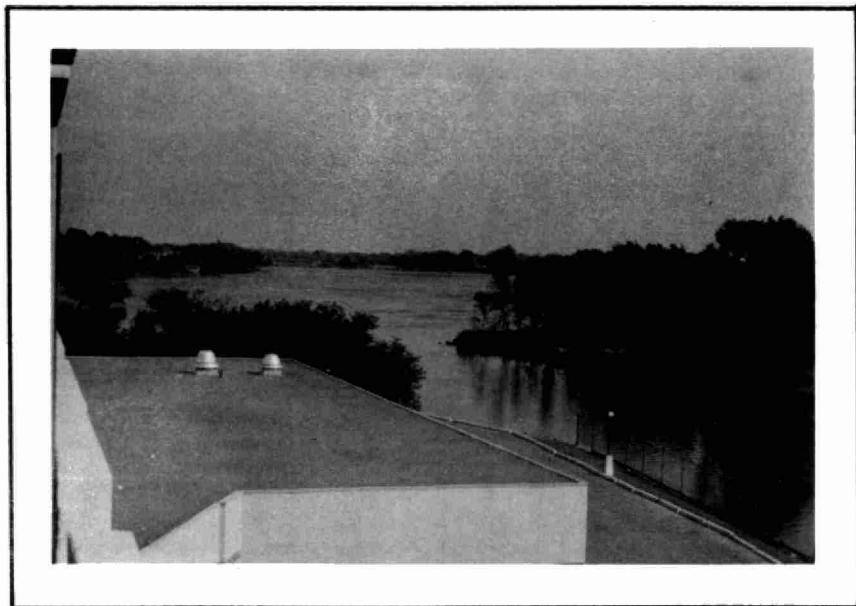
The Town of Smith's Falls is served by a combined sewer system and a 1.8 mgd capacity primary sewage treatment plant. The sewer system includes a number of overflows which discharge untreated sewage to the river during heavy runoff periods. The average flow during 1965 through the sewage treatment plant was 2.21 mgd.

Streamflow records are not available for the Rideau River in the Smith's Falls area, however, the Department of Energy, Mines and Resources does operate a flow gauge on the stream at Ottawa, about 60 miles downstream.

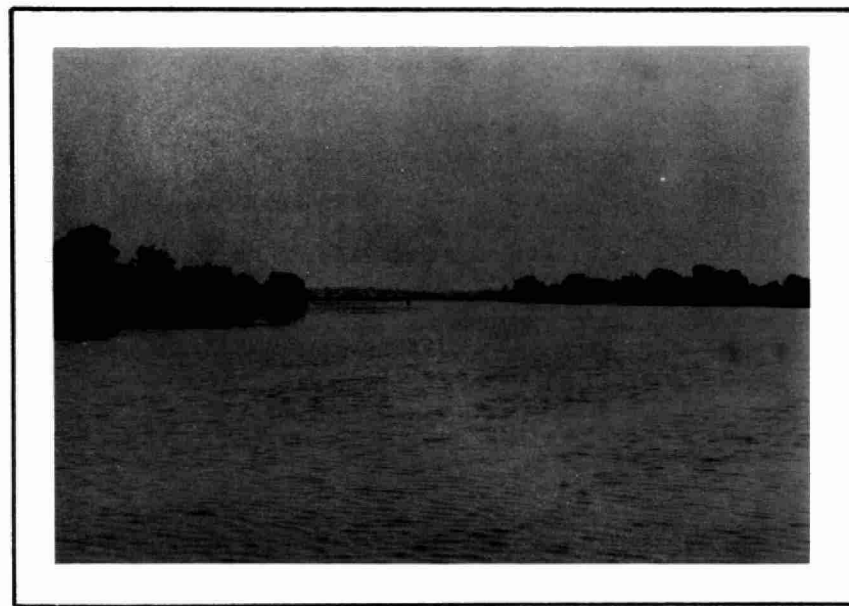
SCOPE OF THE PRELIMINARY SURVEY

Samples for biochemical oxygen demand and dissolved oxygen analysis as well as stream temperatures were taken at each of eleven sampling stations commencing at R-60.4, the easterly municipal limits of the Town of Smith's Falls, and extending downstream to Andrewsville, a distance of about sixteen miles.

RIDEAU RIVER SURVEY



UPSTREAM FROM STATION R-60.4



STATION R-58.2



STATION R-57.4



STATION R-44.0

The stations selected are as follows:

	R-60.4	-	Old Sly Locks
	R-60.3T	-	S.T.P. Outfall
<u>STATION</u>			
1	R-60.2	-	0.1 Miles Below S.T.P. Outfall
2	R-59.8	-	0.5 Miles Below S.T.P. Outfall
3	R-59.2	-	1.1 Miles Below S.T.P. Outfall
4	R-58.9	-	Dam at Locks
5	R-58.2	-	0.7 Miles Below Dam
6	R-57.4	-	At "Lake-Like" Section
7	R-54.7	-	Dam at Kilmarnock
8	R-51.0	-	Opposite Burchill Cottage
9	R-46.8	-	Dam at Merrickville
10	R-44.0	-	Bridge at Andrews ville

FIELD OBSERVATIONS

1. Raw sewage solids were noted at the Smith's Falls sewage treatment plant outfall and several downstream stations. The overflows of the combined sewer systems were not discharging.
2. The profuse growth of aquatic plants was noted throughout the survey area. Many small fish were observed in the stream.
3. The river varies in width from less than 100 feet to more than a mile in places. In the narrower reaches, some water movement was perceptible, however in wider, "lake-like" sections, movement was not detectible.
4. The majority of suitable sampling stations are accessible only by boat.

SURVEY RESULTS

Graphical and tabular results of the August 1966 survey as well as water quality monitoring data are appended to this report.

DISSOLVED OXYGEN

Dissolved oxygen levels were at or above 100% saturation throughout the survey area with only a slight decrease to 7 ppm at R-58.9, 2000 feet below the sewage treatment plant outfall.

Dissolved oxygen rose as high as 14.5 ppm at R-51.0, near a lake-like section where aquatic plants are most abundant.

Water quality monitoring records kept for the past two years at R-60.2 indicate the dissolved oxygen levels remain near saturation throughout the year.

5-DAY BIOCHEMICAL OXYGEN DEMAND

Although the sewage treatment plant effluent exerted a 110 ppm BOD₅, the volume of water in the river diluted the biochemical oxygen demand to satisfactory levels in the stream. Concentrations were below the Commission's objective of 4.0 ppm at each survey station.

Monitoring results indicate that the BOD₅ level at R-60.2 averaged 3.1 ppm for the past two years.

NUTRIENT MATERIALS

Nitrogen and Phosphorus are necessary ingredients for plant growth, and when these materials are present in sufficient quantities they tend to stimulate the growth rate. The abundance of aquatic plants in the Rideau River indicate a surfeit of nutrient materials.

Water quality monitoring data for station R-60.2 support this conclusion with high values of free ammonia (averaging 0.34 ppm) and total Kjeldahl (averaging 1.69 ppm). Nitrate and nitrite levels were low, averaging 0.01 and 0.06 ppm respectively

Total and soluble phosphorus levels were high, averaging 0.77 and 0.61 ppm respectively.

For the purpose of comparison, inorganic nitrogen at 0.30 ppm and soluble phosphorus at 0.01 ppm have been reported to stimulate the growth of excessive amounts of algae.

COLIFORM COUNT

The coliform content downstream from the municipal treatment plant averaged 27,900 organisms per 100 ml. while the upstream value averaged 147 coliforms. The upstream monitoring station was recently established and only three sample results were available for this report. The data are therefore not included in the report. Some of the high counts illustrated by the monitoring data may be attributable to overflows from the combined sewer systems or ineffective chlorination treatment of the sewage treatment plant.

The OWRC objective for surface waters is 2400 coliforms per 100 ml.

CONCLUSIONS

1. A definite impairment of bacteriological water quality downstream from the treatment plant is indicated.
2. Raw sewage solids entering the stream from the Smith's Falls sewage treatment plant, while not affecting dissolved oxygen and biochemical oxygen demand levels to any extent, do detract from the physical appearance of the stream and make it undesirable for recreational use. Considerable enrichment is indicated by high nitrogen and phosphorus concentrations. The abundant variety of aquatic plants and fish support this conclusion.
3. The absence of a noticeable dissolved oxygen sag and low 5-day biochemical oxygen demand levels throughout the survey area lead to the conclusion that a full scale wastewater assimilation study is not warranted on the Rideau River downstream from Smith's Falls.

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GRAPHICAL

AND

TABULAR

RESULTS

RIDEAU RIVER SURVEY (SMITH'S FALLS) AUGUST 29, 1966

STATION	MILEAGE	D.O. (ppm)	TEMP. °C	BOD ₅ (ppm)	REMARKS
	R-60.4	9.0	24	1.2	-Old Sly Locks - 500' Above STP Outfall
STP	R-60.3T	-	-	110	-Raw Sewage Solids Noted in Effluent
1	R-60.2	9.0	23	1.1	-Raw Sewage Solids - Abundant Aquatic Plants
2	R-59.8	7.0	23	2.7	-Raw Sewage Solids - Aquatic Plants & Fish
3	R-59.2	7.5	23	0.9	-Aquatic Plants and Fish
4	R-58.9	9.0	23	1.2	-Evidence of Raw Sewage Solids in Locks
5	R-58.2	9.0	23	1.1	-Abundant Rooted and Floating Aquatic Plants
6	R-57.4	8.0	23	0.8	-Abundant Aquatic Plants
7	R-54.7	11.0	24	1.4	-"Lake-Like" Section
8	R-50.1	14.5	24	3.0	-Dam
9	R-46.8	10.0	24	2.6	
10	R-44.0	8.0	23	2.0	-Rapids

WATER QUALITY MONITORING PROGRAM

RIDEAU RIVER R-60.2 1964 TO 1967				
PARAMETER	AVERAGE	MAX.	MIN.	NUMBER OF SAMPLES
DISSOLVED OXYGEN	9.1	10	7	13
BOD ₅	3.0	4.5	0.6	12
FREE AMMONIA	0.34	0.7	0.01	10
TOTAL KJELDAHL	1.69	2.8	0.06	11
NITRITE	0.01	0.02	0.00	11
NITRATE	0.06	0.3	0.00	11
TOTAL PHOSPHORUS	0.77	1.4	0.12	10
SOLUBLE PHOSPHORUS	0.61	0.80	0.09	10
M.F. COLIFORMS	* 27,900	6,000,000	110	16

* Log Average -

01

STATION

R-60.4
STP

2

3

4

5

6

5.0

7

MILES

8

10.0

DOWNSTREAM

9

15.0

10

DISSOLVED OXYGEN (P.P.M.)

14

13

12

11

10

9

8

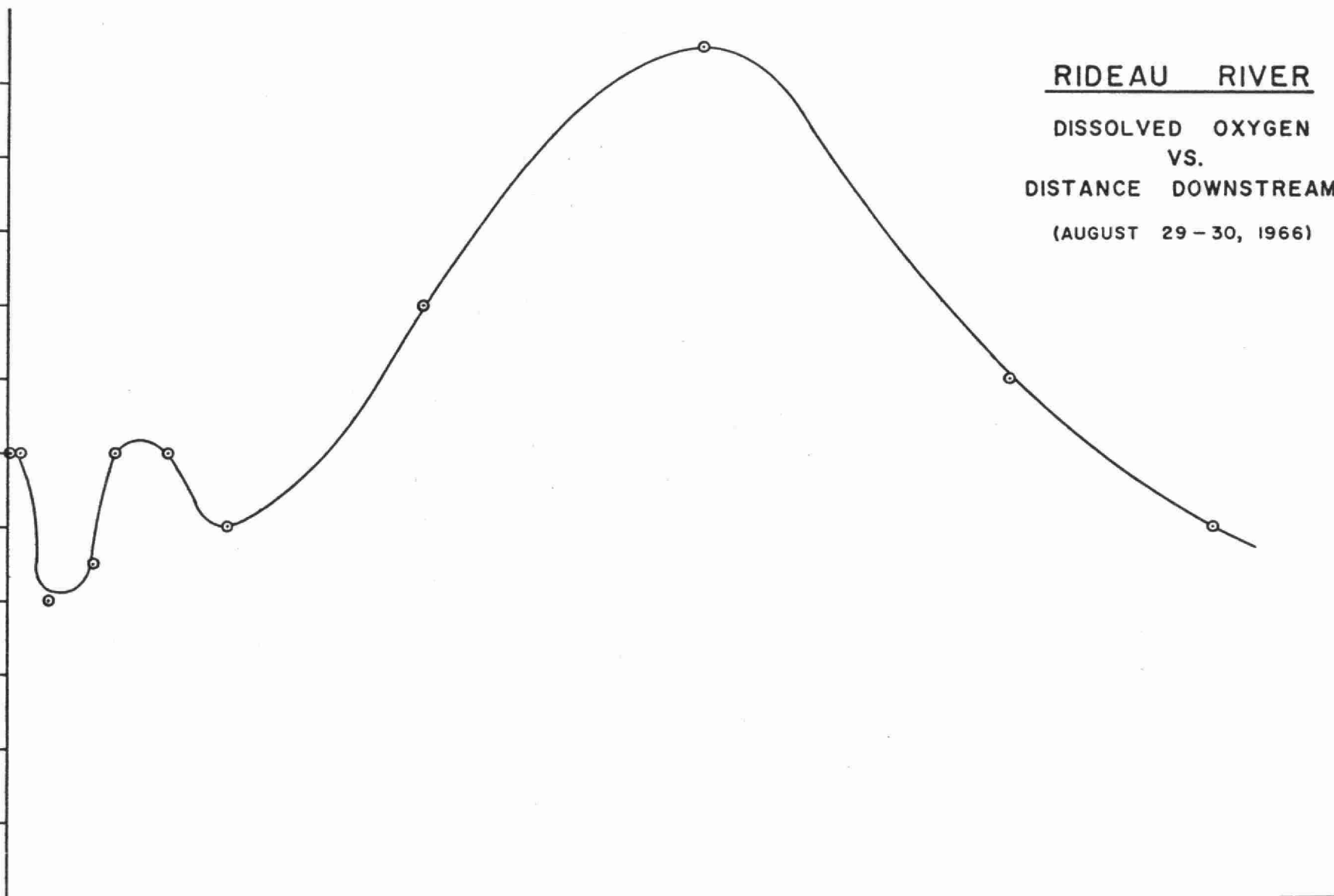
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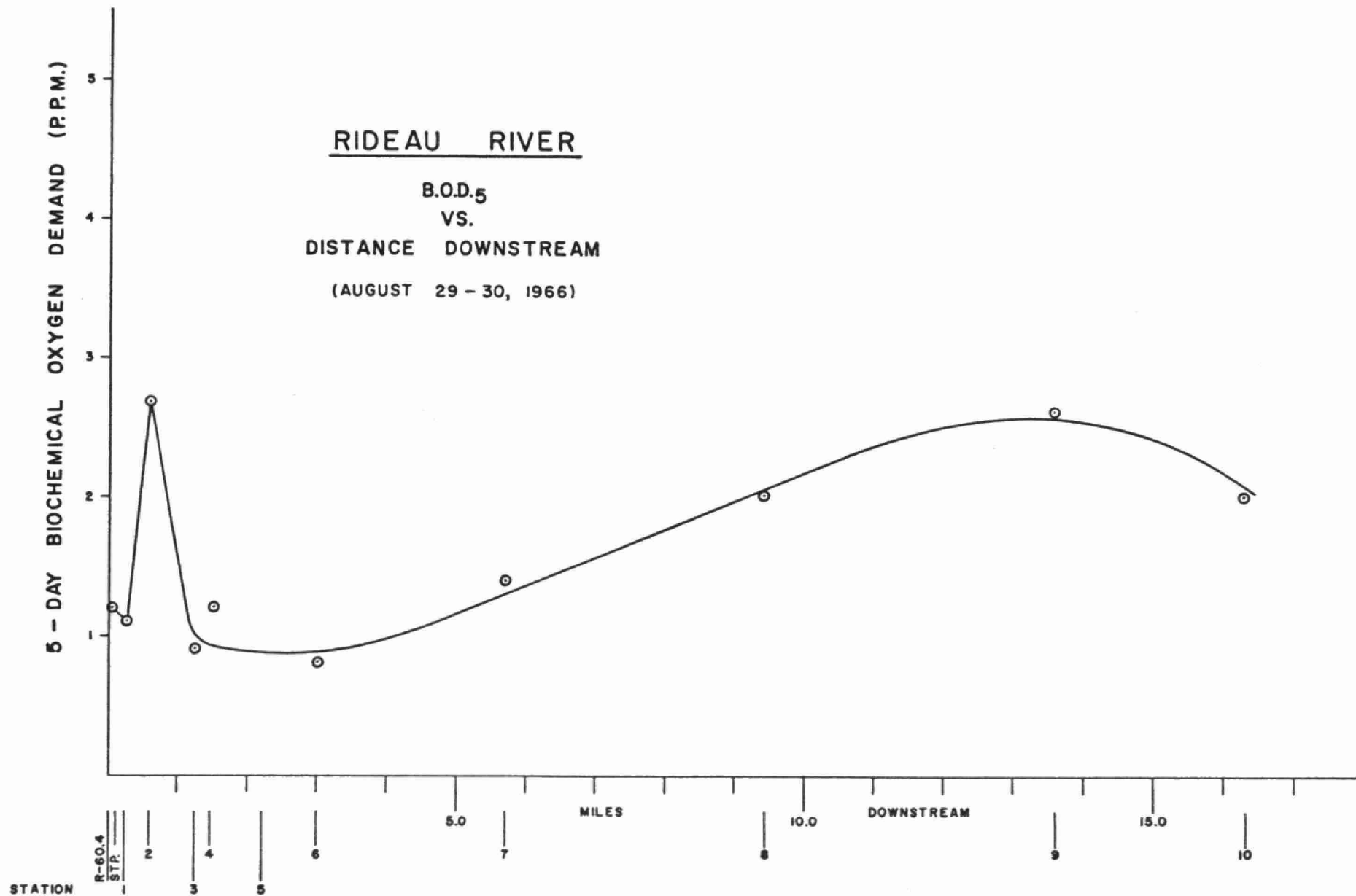
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RIDEAU RIVER
DISSOLVED OXYGEN
VS.
DISTANCE DOWNSTREAM
(AUGUST 29 - 30, 1966)





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